2.8 Math 3C Review

1. Expand and simplify

a) $(x - 5)(x + 3)$

$= x^2 + 3x - 5x - 15$

$= x^2 - 2x - 15$

b) $(x-4)^2 + 10$

$= (x-4)(x-4) + 10$

$= x^2 - 4x - 4x + 16 + 10$

$= x^2 - 8x + 26$

2. Factor the following

a) $x^2 + 5x + 6$

$= (x+2)(x+3)$

b) $x^2 + 3x - 18$

$= (x-3)(x+6)$

c) $x^2 - 9x + 20$

$= (x-4)(x-5)$

d) $x^2 + 2x - 48$

$= (x-6)(x+8)$

e) $2x^2 - 4x - 16$

$= 2(x^2 - 2x - 8)$

$= 2(x+2)(x-4)$

f) $4x^2 + 12x + 8$

$= 4(x^2 + 3x + 2)$

$= 4(x+1)(x+2)$

g) $y = 4x^2 - 4x - 24$

$= 4(x^2 - x - 6)$

$= 4(x+2)(x-3)$

h) $y = 5x^2 + 5x - 30$

$= 5(x^2 + x - 6)$

$= 5(x-2)(x+3)$

3. Change into standard form (expand):

a) $y = -2(x + 5)(x - 3)$

$= -2(x^2 - 3x + 5x - 15)$

$= -2(x^2 + 2x - 15)$

$= -2x^2 - 4x + 30$

b) $y = 2(x + 3)^2 + 5$

$= 2(x+3)(x+3) + 5$

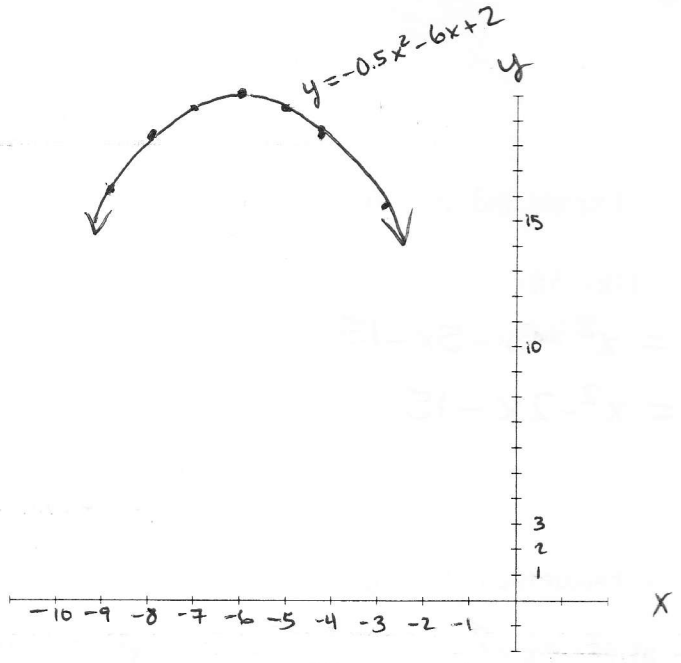
$= 2(x^2 + 3x + 3x + 9) + 5$

$= 2x^2 + 6x + 6x + 18 + 5$

$= 2x^2 + 12x + 23$

2. Graph the parabola $y = -0.5x^2 - 6x + 2$

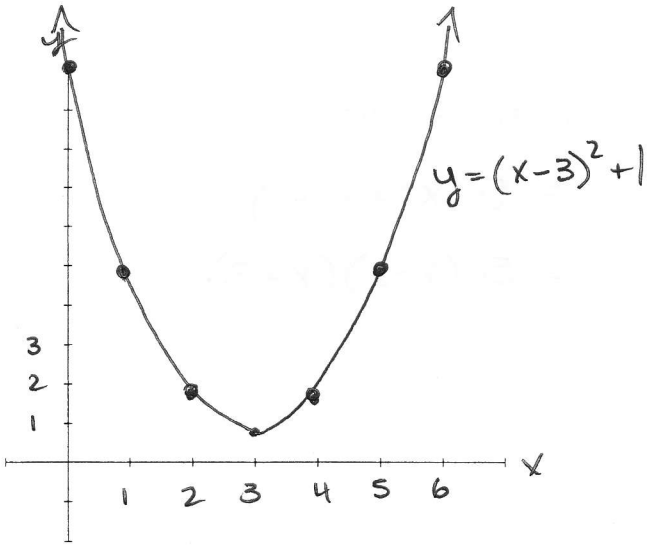
x	$y = -0.5x^2 - 6x + 2$	(x, y)
-9	$=-0.5(-9)^2-6(-9)+2$	15.5
-8		18
-7		19.5
-6		20
-5		19.5
-4		18
-3		15.5



3. Graph the following without making a table of values

a) $y = (x-3)^2 + 1$

Vertex (3,1)
Step pattern 1, 3, 5

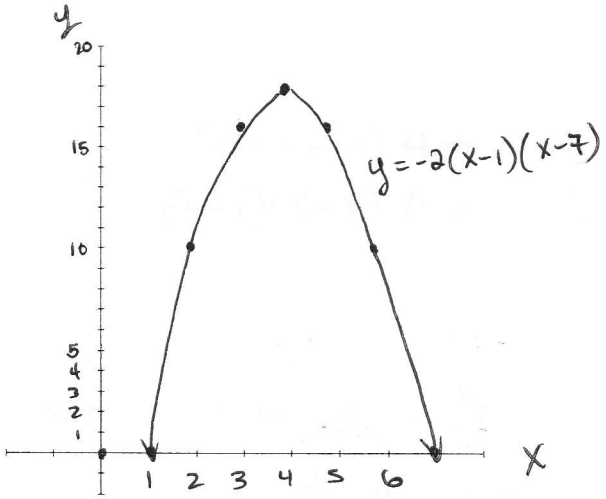


b) $y = -2(x-1)(x-7)$

Zeros: 1 & 7
axis of symmetry: $\frac{1+7}{2}$
$x = 4$

Sub x = 4 into equation
$= -2(4-1)(4-7)$
$= -2(3)(-3)$
$= 18$

Vertex (4,18)
Step pattern −2, −6, −10

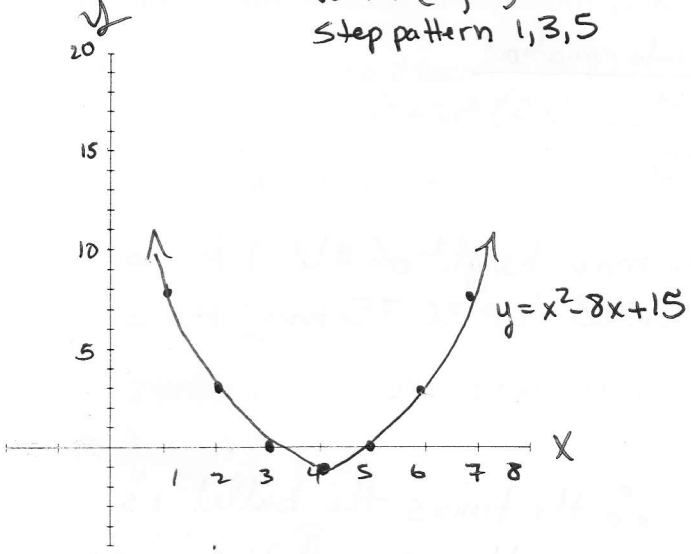


$y = (x-3)(x-5)$
zeros 3 & 5
Axis of symm: $\frac{3+5}{2}$
$x = 4$

sub $x = 4$
$y = (4-3)(4-5)$
$= (1)(-1)$
$= -1$

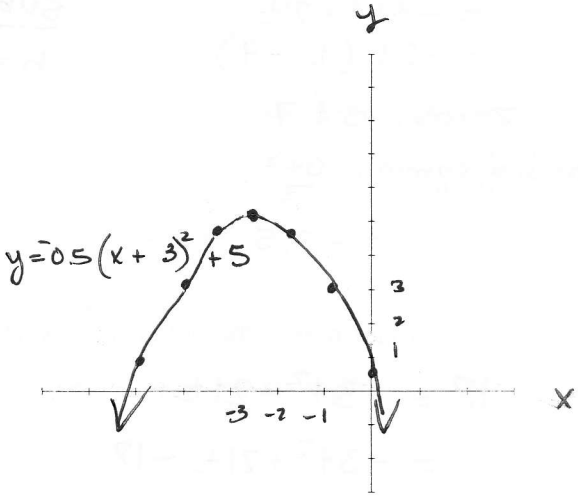
c) $y = x^2 - 8x + 15$

Vertex $(4, -1)$
Step pattern 1, 3, 5



d) $y = -0.5(x+3)^2 + 5$

Vertex $(-3, 5)$
Step pattern: $-0.5, -1.5, -2.5$



4. Change to factored form

a) $y = x^2 - 5x - 24$

$= (x+3)(x-8)$

b) $y = -3x^2 + 15x + 18$

$= -3(x^2 - 5x - 6)$
$= -3(x+1)(x-6)$

c) $h = 6x^2 + 36x$

$= 6x(x+6)$

d) $h = 2t^2 + 2t - 24$

$= 2(t^2 + t - 12)$
$= 2(t-3)(t+4)$

e) $y = -7x^2 - 21x$

$= -7x(x+3)$

f) $h = -7t^2 + 21t$

$= -7t(t-3)$

5. A rifle is fired from a hole in the ground, at an angle into the air. The height, h, of the bullet is given by $h = -3t^2 + 21t$

a) What is the maximum height of the bullet?

$= -3t^2 + 21t$

$= -3t(t-7)$

Zeros: 0 & 7

axis of symm: $\frac{0+7}{2}$

$x = 3.5$

sub $x = 3.5$ into equation

$h = -3(3.5)^2 + 21(3.5)$

$= 36.75$

∴ the max height of the bullet is 36.75 m

b) At what times is the bullet exactly 18 m in the air (hint: when h = 18)?

$18 = -3t^2 + 21t$

$= -3t^2 + 21t - 18$

$= -3(t^2 - 7t + 6)$

$= -3(t-1)(t-6)$

Zeros: 1 & 6

∴ the times the bullet is exactly 18 m in the air is 1 & 6 seconds.

c) When is the bullet at ground level (hint: when h = 0)?

The bullet is at ground level at 7 seconds.

d) Put the equation in vertex form

$y = a(x-h)^2 + k$

$= -3(x-3.5)^2 + 36.75$

6. The Profit, P, earned by making coffee mugs is given by $P = -4n^2 + 64n - 60$ where "n **is the number of mugs in thousands**", and "P **is the profit in thousands of dollars.**"

a) What is the profit/loss if they sell zero mugs? $n=0$

$P = -4(0)^2 + 64(0) - 60$

$P = -60$

∴ if zero mugs are sold they loose $18000.

b) What is the maximum profit?

$= -4(n^2 - 16n + 15)$

$= -4(n-1)(n-15)$

Zeros: 1 & 15

Axis of sym: $\frac{1+15}{2}$

$x = 8$

sub $x=8$ into equation

$= -4(8)^2 + 64(8) - 60$

$= 196$

∴ the max profit is $196 000.

c) How much profit do they make if they sell 8000 mugs?

$= -4(8)^2 + 64(8) - 60$

$= 196$

∴ they make $196 000 in profit if they sell 8000 mugs.

d) How many mugs must they sell to make $ 180,000 profit?

$180 = -4n^2 + 64n - 60$

$= -4n^2 + 64n - 60 - 180$

$= -4n^2 + 64n - 240$

$= -4(n^2 - 16n + 60)$

$= -4(n-6)(n-10)$

∴ they have to make 6000 or 10 000 mugs to make $180 000 in profit.